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The role of preoperative transvaginal ultrasound in evaluating the myometrial invasion depth in women with endometrial cancer

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ABSTRACT

Aim: The aim of our study was to compare the results of transvaginal ultrasonography (TVS) and final pathology in the determination of the depth of myometrial invasion in endometrial cancer preoperatively.

Methods: The study was conducted as prospective observational study in a tertiary center between August 2012 -July 2012 and included 29 patients between the ages of 43 and 83 with endometrial biopsy results. Patients with endometrium cancer dignosis based on endometrial biopsy results were enrolled.

Results:. Transvaginal endometrial thickness was thicker for patients with myometrial invasion greater than ½ according to final pathology results, but this result was not statistically significant. When the patients were classified according to their surgical stages, 13 patients were stage 1a, 5 patients were stage 1b, 3 patients were stage 2, 6 patients stage 3, 2 patients stage 4. Final pathology of myometrial invasion greater than ½ patients compared with patients with thinner endometrium regarding age (p=0.003), gravidity (p=0.111), parity (p=0.135), weight (p=0.764), platelets (p= 0.831), CA125 (p=0.247) respectively. The age of patients were not statistically significant in comparison with tumor stage (p= 0.80). No statistical difference was observed when final pathology and transvaginal ultrasound results regarding myometrial invasion were compared (p= 1). We found that the sensitivity of preoperative transvaginal ultrasound for evaluation of myometrial invasion which is lesser than ½ was 77.7%. When final pathology and frozen section results were compared no significant statistical difference was found. (p=0.14).

Conclusion: In our study, we compared the results of myometrial invasion in patients with pathologic and ultrasonographic findings and we found no statistically significant difference.

Keywords: Endometrial cancer, transvaginal ultrasonography, myometrial invasion

INTRODUCTION

Endometrial cancer ranks first in developed countries and second after cervical cancer worldwide among all gynecologic cancers, also fourth among all cancers after breast, lung and colorectal cancers.[1,2] According to the decision of FIGO in 1988, endometrial cancer is a cancer that requires surgical staging. The traditional approach is midline abdominal incision followed by peritoneal washing, cytology, total abdominal hysterectomy (TAH), bilateral salpingooopherectomy (BSO), and in selected high-risk cases omentectomy, pelvic and paraaortic lenfadenectomy.[3,4] The most important prognostic factors of endometrial cancer are the histologic grade, stage of disease and the depth of myometrial invasion.[4] In a study of 1566 patients, myometrial invasion was reported to be the most important prognostic factor.[5] A direct relationship between the depth of myometrial invasion and lymph node involvement has been demonstrated in other studies.[6-8] The depth of myometrial invasion is an important prognostic factor which is directly related to the risk of disease recurrence and extrauterine disease.[9] The depth of tumor invasion in to the myometrium increases the probability of extrauterine spread and recurrence as the drainage of the lymphatic system becomes easier when the depth exceeds %50.[10,11] This is the most important pathological finding that determines whether or not lymphadenectomy should be added to surgery.

Pelvic and paraaortic lymph node metastases are directly proportional to the myometrial invasion depth and histological grade of the tumor. Magnetic resonance imaging (MRI), ultrasonography (US) and computerized tomography

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(CT) were used for preoperative evaluation of endometrial cancer and to determine the depth of myometrial invasion.

The aim of our study was to compare the results of transvaginal ultrasonography (TVS) and final pathology in the determination of the depth of myometrial invasion in endometrial cancer preoperatively.

METHODS

The study was conducted as prospective observational study in a tertiary center between August 2012 -July 2012 and included 29 patients between the ages of 43 and 83 with endometrial biopsy results. Patients with endometrium cancer dignosis based on endometrial biopsy results were enrolled. Before the participation to the study patients were given informed concent which was approved by the Kocaeli University Ethics Committee (Date: 24.07.2012, Decision No: 9/12 KOU KAEK 2012/75). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

Patient's demographic characteristics (age, weight, gravidity, parity, abortion, curretage history), other co-morbidities of patients, CA125, platelet values were noted. The patients diagnosed with endometrium cancer were evaluated with MedisonSonoace X8 US using transvaginal transducer the day before the operation. All examinations were performed after the patient completely emptied her bladder in the lithotomy position. After inserting the endovaginal probe into the vagina, the vaginal probe was placed into the posterior vaginal fornix and the section of the uterus in the sagittal plane was taken. The uterus and adnexal regions were completely screened.

Uterine dimensions were measured in three different planes. In the sagittal section of the uterus, the endometrial thickness was measured from the point at which the thickness was maximum, including both endometrial layers. Myometrial invasion areas of the endometrial density extending from the normal endometrial basal layer into the myometrium were evaluated as invasion and the area reaching the deepest depth from the basal layer line was measured perpendicular to the nearest uterin serosa. The distance of the endometrial basal layer at the same point to the uterine serosa was determined.

At the end of the examination, patients were grouped according to the degree of myometrium invasion as follows:

- There was no invasion in the presence of a continuous halo surrounding endometrial echoes and no endometrial echoes extending to myometrium.
- If the ratio of the accepted distance to the whole wall is over ½, it was accepted as more than ½ invasion.
- If the ratio of the accepted distance to the whole wall is below ½, less than ½ invasion was accepted.

Preoperative TVS findings and postoperative final histopathology results were compared and the importance of TVS in determining myometrial invasion in endometrial cancer was determined.

The surgical operations of patients were performed according to frozen section and the stages of patients.

Statistical Analysis

"SPSS 21.0" statistical program was used for the statistical analysis of the collected data. For descriptive statistics, numbers and percentages were given for categorical variables, and mean, standard deviation were given for numerical variables. In the analysis of quantitative data Kruskal-Wallis test was used. Wilcoxon signed-rank test was used in the inter-group comparison of parameters. The results were evaluated to be in the confidence interval of 95% and had a significance at the level of $p<0.05$.

RESULTS

Twenty nine patients with endometrial cancer diagnosis between 43 and 83 years old were included in a study. Demographic characteristics of the patients were summarized in **Table 1**. All patients were over 154 pounds. In our patients' distribution; 1 patient had hyperlipidemia, 2 patients had hypothyroidism, 2 patients had chronic obstructive pulmonary disease (COPD), 1 patient had a history of cerebrovascular disease (CVD), and 1 patient had been treated for breast cancer.

Table 1: Demographic characteristics

	Mean±std deviation
Age	60.10±9.74
Weight	86.55±8.79
Gravidity	4.48±2.23
Parity	3.44±1.76
Abortion	0.24±0.51
Curettage	0.86±1.43

std deviation: standart deviation

Table 2 shown transvaginal endometrial thickness was thicker for patients with myometrial invasion greater than ½ according to final pathology results, but this result was not statistically significant.

Table 2: Endometrial thickness values according to final pathology

	Endometrial thickness (mean±std deviation)	P
Myometrial invasion<1/2 N=18	15.00±8.16	0.052
Myometrial invasion>1/2 N=11	22.82±12.60	

std deviation: standart deviation

When the patients were classified according to their surgical stages, 13 patients were stage 1a, 5 patients were stage 1b, 3 patients were stage 2, 6 patients stage 3, 2 patients stage 4. The operations performed according to the stages of the patients are indicated in the table. TVS was performed and hysterectomy salpingoopherectomy and lymphadenectomy were performed in 11 patients with endometrial myometrial thickness more than 1/2.

Table 3 shown endometrial carcinoma histologic types and surgical FIGO stages of patients.

Table 3: Stage and histological type of patient distribution

	Surgical FIGO Stages	
Endometrial cancer histological types		**Total**
Endometrioid	Stage IA (n=13)	27 (93.1%)
	Stage IB (n=5)	
	Stage II (n=2)	
	Stage IIIA (n=3)	
	Stage IIIC (n=3)	
	Stage IV (n=1)	
Serous carcinoma	Stage IV (n=1)	2 (6.9%)
Clear cell carcinoma	Stage II (n=1)	

Final pathology of myometrial invasion greater than ½ patients compared with patients with thinner endometrium regarding age (p=0.003), gravidity (p=0.111), parity (p=0.135), weight (p=0.764), platelets (p=0.831), CA125 (p=0.247) respectively. The age of patients were not statistically significant in comparison with tumor stage (p= 0.80).

No statistical difference was observed when final pathology and transvaginal ultrasound results regarding myometrial invasion were compared (p=1). We found that the sensitivity of preoperative transvaginal ultrasound for evaluation of myometrial invasion which is lesser than ½ was 77.7%. When final pathology and frozen section results were compared no significant statistical difference was found. (p=0.14). Distribution of patients regarding myometrial invasion by transvaginal ultrasonography, frozen section results in relation with final pathology results were given in **Table 4**.

Table 4: Distribution of patients regarding myometrial invasion by transvaginal ultrasonography, frozen section results in relation with final pathology results

	Final pathology result		Total	P
	<1/2a	>1/2b		
TVc Ultrasonography				
<1/2	14	2	16	1
>1/2	4	9	13	
Frozen Section				
<1/2	18	2	20	0.14
>1/2	0	9	9	
Total	18	11	29	

a<1/2: lesser than ½ myometrial invasion b>1/2: greater than ½ myometrial invasion
c TV: Transvaginal

DISCUSSION

While CT is better in clinical staging, its sensitivity is low in detecting the depth of myometrial invasion. The accuracy of MRI was reported to be 85%.[12] TVS is cheaper and easier to use than MRI. In our study, we showed that TVS was sensitive to the depth of myometrial invasion (77.5%).

Gordon et al.[12] in a study conducted with 25 patients in preoperative period of detecting the depth of myometrial invasion, the depth of myometrial invasion with TVS 84% accurate.

Ozdemir et al.[13] compared the TVS with MRI and reported that two techniques had the same efficiency, and also suggested doing MRI if TVS does not get sufficient results. TVS, MRI and frozen section examination of the preoperative and intraoperative diagnosis of myometrial invasion for the evaluation of the difference in myometrial invasion, although there was no statistically significant difference in the evaluation of myometrial invasion with frozen section showed beter results.

In a study of 155 women with endometrial carcinoma, Savelli et al.[14] showed that intraoperative frozen section results were more reliable than preoperative TVS in the evaluation of myometrial invasion. In our study, TVS was as reliable as the results of frozen section examination when it was confirmed by the final pathology results (in order of p=1, p=0.014). Frozen section examination should be taken in to consideration in cases where TVS is not reliable and when the decision to perform lymphadenectomy is decided.

In a retrospective longitudinal study of 187 endometrial carcinomas, TVS, MRI and frozen section showed a sensitivity of 56%, 71% and 67% and a specificity of 90%, 78% and 94%, respectively.[15]

In a country wide cohort study from Sweden which is record based for the clinical assessment of depth of myometrial invasion in endometrial carsinom, TVS was the most extensive method reported, the second common method was MRI which is followed by intraoperative gross examination, and frozen section. Most sensitivite method (90%) to find MI > 50 % was frozen section whereas the sensitivity of gross examination was lower (72%). Among the preoperative methods the sensitivity of MRI (77%) was higher than TVS (66%).[16]

In our study, 13 patients in Stage 1a, 5 patients in Stage 1b, 3 patients in Stage 2, 3 patients in Stage 3a, 3 patients in 3c and 2 patients in Stage 4 were found. The pathology results of a patient with stage 4 were classified as serous and stage 2.

Similar results were found between stage 1 hysterectomy and modified radical hysterectomy in stage 1 disease.[17] In the endometrioid group, there is said to be no need for omentectomy if there was no deep myometrial invasion or grade 3 in clinical stage 1.[18,19] In our study, hysterectomy salpingooferectomy and lymphadenectomy were performed in 11 patients with endometrial myometrial thickness more than 1/2.

Results of intraoperative frozen sections and postoperative final pathology results in 2 patients who had fibroids were incompatible. Myometrial invasion in our preoperative transvaginal application revealed that the myometrial invasion was greater than 1/2 in final pathology results of these 2 patients whose frozen section examination results were found to be less than 1/2. The preoperative TVS myometrial invasion evaluations and the final pathology results of the patients who had myoma in the uterus were incompatible with each other. Therefore, the use of TVS in the preoperative evaluation of patients with myoma seems to be causing incorrect results and incomplete operation.

CONCLUSION

In our study, we compared the results of myometrial invasion in patients with pathologic and ultrasonographic findings and we found no statistically significant difference. This statistical result showed that the pathology and ultrasound data matched. If we integrate with intraoperative frozen section pathology results, we can determine the depth of myometrial invasion with the use of preoperative TVS and decide the operation which has the least morbidity but not the worst effect to survive. Accurate detection of myometrial invasion depth with TVS in patients with uterine leiomyoma was difficult and there was no correlation with the final pathology results. The experience of the TVS practitioner affects the correct detection results. Due to the small number of patients, the findings of previous studies were not statistically significant in our study. Additional prospective studies are needed with more patients. The sensitivity of TVS is similar to the literature in our study.

ETHICAL DECLARATIONS

Ethics Committee Approval: The study was carried out with the permission of Kocaeli University Ethics Committee (Date: 24.07.2012, Decision No: 9/12 KOU KAEK 2012/75).

Informed Consent: All patients signed the free and informed consent form.

Referee Evaluation Process: Externally peer-reviewed.

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I was born in Bursa in 1981, I am married and have a child. I entered medical school, which has been my dream since I was little and graduated from Gazi Medicine in 2006. I have been in the academic area for nearly 16 years since I graduated. I am a specialist in Gynecology. My special interests are Obstetri, Endocrinology. I have been editing academic journals and books for many years. I will be happy to take part in projects that I think will benefit the health community and contribute to science.